

Reference Name: NIA-TIC-101-9/25 Insulation Materials Specification Chart from NIA

This chart provides material properties as typically specified in ASTM material specifications and is a guide to performance characteristics but may not be sufficient for writing specifications. Consult the manufacturer for specific properties.

Physical Properties ^{1, 4, 5, 6, 7}	Elastomeric Tube and Sheet	Elastomeric Tube and Sheet – High Temp	Elastomeric Tube and Sheet – Low Halogen	Cellular Glass Block	Cellular Glass Pipe	Polystyrene Board (XPS)	Polystyrene Pipe (XPS)	Polyisocyanurate	Physical Properties ^{1, 4, 5, 6, 7}
Type of Material	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Type of Material
ASTM Standard	C534 Grade 1	C534 Grade 2	C534 Grade 3	C552 Grade 6, Type I	C552 Grade 6, Type II	C578 Types V, VI, VII, X, XII, XIII	C578 Type XIII	C591 Types I, II, III, IV, V, VI Grade 2	ASTM Standard
Use Temp °F (°C) - Max.	220 (104)	300 (149)	250 (121)	800 (427)	800 (427)	165 (74)	165 (74)	300 (149)	Use Temp °F (°C) - Max.
Use Temp °F (°C) - Min.	-297 (-183)	-297 (-183)	-297 (-183)	-450 (-268)	-450 (-268)	-65 (-54)	-320 (-196)	-297 (-183)	Use Temp °F (°C) - Min.
⁶ Apparent Thermal Conductivity Test Method in the Stated ASTM Specification	C518 &/or C177	C518 &/or C177	C518 &/or C177	C518 &/or C177	C335	C518 &/or C177	C518 &/or C177	C518 &/or C177	⁶ Apparent Thermal Conductivity Test Method in the Stated ASTM Specification
⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:	⁶ Apparent Thermal Conductivity Max. (Btu-in/h ft ² F) at Mean Temperatures of:								⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:
-100°F (-73°C)	0.21	0.21	0.21	0.21	0.23	N/A ³	0.181	0.17 – 0.19	-100°F (-73°C)
0°F (-18°C)	0.26	0.26	0.26	0.27	0.29	N/A ³	0.221	0.19 – 0.22	0°F (-18°C)
75°F (24°C)	0.28	0.30	0.28	0.31	0.34	0.20 – 0.256	0.256	0.19 – 0.22	75°F (24°C)
200°F (93°C)	N/R ³	0.38	N/R ³	0.40	0.43	N/A ³	N/A ³	0.26 – 0.30	200°F (93°C)
400 °F (204°C)	N/A ³	N/A ³	N/A ³	0.58	0.63	N/A ³	N/A ³	N/A ³	400 °F (204°C)
600°F (316°C)	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	600°F (316°C)
Compressive Resistance (psi) (C165/C1621) – Min.	N/S ³	N/S ³	N/S ³	60	N/R ³	15 – 100	20	20 – 125	Compressive Resistance (psi) (C165/C1621) - Min.
Corrosion of Carbon Steel (ASTM C1617)	N/R ³	N/R ³	N/R ³	< DI water	< DI water	N/S ³	N/S ³	N/S ³	Corrosion of Carbon Steel (ASTM C1617)
Density, lbs/ft3, (kg/m3)	N/R ³	N/R ³	N/R ³	6.12 min	6.12 min	1.2 – 3.0	1.6	1.8 – 6.0	Density, lbs/ft3, (kg/m3)
Linear Change at Max Temp (C356 / D2126), %	7% (C 356)	7% (C 356)	7% (C 356)	N/S ³	N/S ³	2% max (D 2126)	2% max (D 2126)	2% max (D 2126)	Linear Change at Max Temp (C356 / D2126), %
Min. Flexural Strength (psi) Min. (C203)	N/S ³	N/S ³	N/S ³	41	41	40 – 100	45	N/S ³	Min. Flexural Strength (psi) Min. (C203)
pH	N/S ³	N/S ³	N/S ³	N/R ³	N/R ³	N/S ³	N/S ³	N/S ³	pH
Behavior in a Vertical Tube Furnace (ASTM E136)	N/S ³	N/S ³	N/S ³	Pass	Pass	N/S ³	N/S ³	N/S ³	Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed	N/R ³	N/R ³	N/R ³	5/0	5/0	N/R ³	N/R ³	N/R ³	Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed
Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B	A - 0.10 (1.44 x 10 ⁻¹⁰)	A - 0.30 (4.32 x 10 ⁻¹⁰)	A - 0.30 (4.32 x 10 ⁻¹⁰)	B - 0.005 (7.3 x 10 ⁻¹²)	B - 0.005 (7.3 x 10 ⁻¹²)	A - 1.1 to 2.0 (1.6 to 2.9 x 10 ⁻⁹)	A - 2.0 (2.9 x 10 ⁻⁹)	A - 2.0 to 4.0 (2.9 to 5.8 x 10 ⁻⁹)	Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B
Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)
Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %	0.2	0.2	0.2	0.5	0.5	0.3	1.0	0.8 - 2.0	Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %

Physical Properties ^{1, 4, 5, 6, 7}	Phenolic Foam Unfaced	Melamine Foam	Polyolefin Sheet and Tube	Polyimide Foam	Polyimide Foam	Polyimide Rigid Cellular	Mineral Fiber Pipe	Mineral Fiber Pipe	Mineral Fiber Pipe	Mineral Fiber Blanket	Physical Properties ^{1, 4, 5, 6, 7}
Type of Material	Cellular	Cellular	Cellular	Cellular	Cellular	Cellular	Fibrous	Fibrous	Fibrous	Fibrous	Type of Material
ASTM Standard Specification	C1126 Type III Grade I, II, III, IV	C1410 Type I, II, III	C1427 Type I, II	C1482 Type I	C1482 Type VI	C1594 Type II, Grade 3, Class I	C547 Type I ¹²	C547 Type II, III & V ¹²	C547 Type IV ¹²	C553 Type I & II ¹²	ASTM Standard
Use Temp °F (°C) - Max.	257 (125)	350 (177)	200 (93)	400 (204)	572 (300)	600 (316)	850 (454)	1200 (649) – T II, T III 1400 (760) – T V	1000 (538)	450 (232)	Use Temp °F (°C) - Max.
Use Temp °F (°C) - Min.	-290 (-180) ¹⁶	-40 (-40)	-150 (-101)	-328 (-200)	-328 (-200)	-423 (-253)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	Use Temp °F (°C) - Min.
Apparent Thermal Conductivity Test Method in the Stated Standard Specification	C518 &/or C177	C518	C518 &/or C177	C518	C518	C518 &/or C177	C335	C335	C335	C518 &/or C177	Apparent Thermal Conductivity Test Method in the Stated Standard Specification
⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:	⁶ Apparent Thermal Conductivity Max. (Btu-in/h ft ² F) at Mean Temperatures of:										
-100°F (-73°C)	0.18 – 0.24	N/A ³	0.29	0.21	0.21	0.066	N/A ³	N/A ³	N/A ³	N/A ³	-100°F (-73°C)
0°F (-18°C)	0.18 – 0.24	N/A ³	0.33	0.27	0.28	0.138	N/A ³	N/A ³	N/A ³	N/A ³	0°F (-18°C)
75°F (24°C)	0.18 – 0.24	0.27	0.35	0.32	0.34	0.246	0.24	0.24	0.24	0.36 (I) 0.31 (II)	75°F (24°C)
200°F (93°C)	0.25 – 0.31	0.41	N/A ³	0.51	0.50	0.396	0.31	0.31	0.31	0.55 (I) 0.44 (II)	200°F (93°C)
400 °F (204°C)	N/A ³	N/A ³	N/A ³	0.82	0.82	0.648	0.51	0.45	0.45	N/R ³	400 °F (204°C)
600°F (316°C)	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/R ³	0.65	0.65	N/A ³	600°F (316°C)
Compressive Resistance, psi (kPa), (C165/C1621) – Min.	18	N/S ³	N/S ³	0.5 @ 25%	0.5 @ 25%	N/R ³	N/S ³	N/S ³	N/S ³	N/S ³	Compressive Resistance, psi (kPa), (C165/C1621) – Min.
Corrosion of Carbon Steel (ASTM C1617)	N/R ³	N/R ³	N/S ³	N/R ³	N/R ³	N/R ³	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	Corrosion of Carbon Steel (ASTM C1617)
Density, lbs/ft ³ , (kg/m ³)	2 – 7.5 min	0.25 – 0.63	2.5 max	0.36 – 0.53	0.35 – 0.55	3.0 max	N/R ³	N/R ³	N/R ³	6 max ¹¹	Density, lbs/ft ³ , (kg/m ³)
Linear Change at Max Temp (C356 / D2126), %	2% max (D 2126)	5% max (D 2126)	7% max (D 2126)	N/S ³	N/S ³	N/S ³	2% max (C 356)	2% max (C 356)	2% max (C 356)	N/S ³	Linear Change at Max Temp (C356 / D2126), %
Min. Flexural Strength (psi) Min. (C203)	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Min. Flexural Strength (psi) Min. (C203)
pH	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	pH
Behavior in a Vertical Tube Furnace (ASTM E136)	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed	25/50	25/50	N/R ³	10/15	10/15	10/15	25/50	25/50	25/50	25/50	Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed
Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B	A – 5.0 (7.3 x 10 ⁻⁹)	N/S ³	A – 0.05 (7.3 x 10 ⁻¹¹)	N/S ³	N/S ³	B – 8.0 (1.2 x 10 ⁻⁸)	N/S ³	N/S ³	N/S ³	N/S ³	Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B
Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)	N/S ³	20.0	N/S ³	N/S ³	N/S ³	N/S ³	5.0	5.0	5.0	5.0	Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)
Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %	3.0	N/S ³	0.2	N/S ³	N/S ³	N/S ³	(13), (14)	(13), (14)	(13), (14)	(13), (15)	Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %

Physical Properties ^{1, 4, 5, 6, 7}	Mineral Fiber Blanket	Mineral Fiber Blanket	Mineral Fiber Blanket	Mineral Fiber Metal Mesh Blanket	Mineral Fiber Board	Mineral Fiber Board	Mineral Fiber Board	Physical Properties ^{1, 4, 5, 6, 7}
Type of Material	Fibrous	Fibrous	Fibrous	Fibrous	Fibrous	Fibrous	Fibrous	Type of Material
ASTM Standard Specification	C553 Type IV¹²	C553 Type V & VI¹²	C553 Type VII¹²	C592 Type I & II¹²	C612 Type 1A, 1B, II, III¹²	C612 Type IV A&B¹²	C612 Type V¹²	ASTM Standard Specification
Use Temp °F (°C) - Max.	850 (454)	1000 (538)	1200 (649)	TI - 850 (454), TII - 1200 (649)	450 (232) – 1000 (538)	1200 (649)	1800 (982)	Use Temp °F (°C) - Max.
Use Temp °F (°C) - Min.	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	80 (27)	Use Temp °F (°C) - Min.
Apparent Thermal Conductivity Test Method in the Stated Standard Specification	C518 &/or C177	C518 &/or C177	C518 &/or C177	C518 &/or C177	C518 &/or C177	C518 &/or C177	C518 &/or C177	Apparent Thermal Conductivity Test Method in the Stated Standard Specification
⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:	⁶ Apparent Thermal Conductivity Max. (Btu-in/h ft ² F) at Mean Temperatures of:							⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:
-100°F (-73°C)	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	-100°F (-73°C)
0°F (-18°C)	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³	0°F (-18°C)
75°F (24°C)	0.25	0.31 (V) 0.26(VI)	0.25	0.25	0.25 – 0.26	0.24 – 0.25	0.45	75°F (24°C)
200°F (93°C)	0.34	0.44 (V) 0.36(VI)	0.34	0.34	0.34 – 0.36	0.30 – 0.34	0.47	200°F (93°C)
400 °F (204°C)	N/R ³	0.89 (V) 0.60(VI)	0.55	0.55 (I) 0.53 (II)	0.55	0.42 – 0.55	0.52	400 °F (204°C)
600°F (316°C)	N/R ³	1.50 (V) 1.05(VI)	0.89	N/R (I) 0.75 (II)	0.90	0.63 – 0.85	0.59	600°F (316°C)
Compressive Resistance, psi (kPa), (C165/C1621) – Min.	N/S ³	N/S ³	N/S ³	N/S ³	0.083 – 0.174 @10%	0.347 @ 10%	6.94 @ 10%	Compressive Resistance, psi (kPa), (C165/C1621) – Min.
Corrosion of Carbon Steel (ASTM C1617)	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	Corrosion of Carbon Steel (ASTM C1617)
Density, lbs/ft ³ , (kg/m ³)	8 max ¹¹	10 max ¹¹	12 max ¹¹	10 (Type I) 12 (Type II) max	8-10 (max) ¹¹	12	20	Density, lbs/ft ³ , (kg/m ³)
Linear Change at Max Temp (C356 / D2126), %	N/S ³	N/S ³	N/S ³	4% max (C 356)	2% max (C 356)	2% max (C 356)	4% max (C 356)	Linear Change at Max Temp (C356 / D2126), %
Min. Flexural Strength (psi) Min. (C203)	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Min. Flexural Strength (psi) Min. (C203)
pH	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	pH
Behavior in a Vertical Tube Furnace (ASTM E136)	N/S ³	N/S ³	N/S ³	Pass	N/S ³	N/S ³	N/S ³	Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed	25/50	25/50	25/50	25/50	25/50	25/50	25/50	Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed
Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B
Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)
Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %	(13), (15)	(13), (15)	(13), (15)	(13), (15)	(13), (15)	(13), (15)	(13), (15)	Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %

Physical Properties ^{1, 4, 5, 6, 7}	Calcium Silicate Pipe and Block	Expanded Perlite Pipe & Block	Microporous	Microporous	Flexible Aerogel Low Temp	Flexible Aerogel High Temp	Flexible Aerogel Pipe	Flexible Aerogel Dual Temp	Flexible Aerogel High Temp	Physical Properties ^{1, 4, 5, 6, 7}
Type of Material	Granular	Granular	Granular	Granular	Granular	Granular	Granular	Granular	Granular	Type of Material
ASTM Standard Specification	C533 Type I	C610	C1676 Type II, Grade 2A Non-hydrophobic	C1676 Type II, Grade 2B Hydrophobic	C1728 Type I, Grade 1B	C1728 Type III, Grade 1A	C1728 Type III, Grade 2	C1728 Type IV, Grade 1A	C1728 Type V, Grade 1	ASTM Standard Specification
Use Temp °F (°C) - Max.	1200 (649)	1200 (649)	1832 (1000)	1832 (1000)	257 (125)	1200 (649)	1200 (649)	482 (250)	1200 (649)	Use Temp °F (°C) - Max.
Use Temp °F (°C) - Min.	80 (27)	80 (27)	176 (80)	176 (80)	-321 (-196)	75 (24)	75 (24)	-321 (-196)	75 (24)	Use Temp °F (°C) - Min.
Apparent Thermal Conductivity Test Method in the Stated Standard Specification	C177, C335 &/or C518	C177, C335 &/or C518	C518, C177 &/or C201	C518, C177 &/or C201	C177	C177	C335	C177	C177	Apparent Thermal Conductivity Test Method in the Stated Standard Specification
⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:	⁶ Apparent Thermal Conductivity Max. (Btu-in/h ft ² F) at Mean Temperatures of:									⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:
-100°F (-73°C)	N/A ³	N/A ³	N/S ³	N/S ³	0.10	N/A ³	N/A ³	0.12	N/A ³	-100°F (-73°C)
0°F (-18°C)	N/A ³	N/A ³	N/S ³	N/S ³	0.11	N/A ³	N/A ³	0.14	N/A ³	0°F (-18°C)
75°F (24°C)	N/A ³	N/A ³	N/S ³	N/S ³	0.12	0.14	0.16	0.15	0.20	75°F (24°C)
200°F (93°C)	0.45	0.53	0.211	0.211	0.13	0.16	0.18	0.16	0.26	200°F (93°C)
400 °F (204°C)	0.55	0.64	0.242	0.242	N/A ³	0.20	0.24	0.20	0.34	400 °F (204°C)
600°F (316°C)	0.66	0.75	0.272	N/A ³	N/A ³	0.25	0.33	N/S ³	0.44	600°F (316°C)
Compressive Resistance, psi (kPa), (C165/C1621) – Min.	100 @ 5%	70 @ 5%	7.3 @ 10%	3.6 @ 10%	5 @ 10%	3 @ 10%	3 @ 10%	5 @ 10%	3 @ 10%	Compressive Resistance, psi (kPa), (C165/C1621) – Min.
Corrosion of Carbon Steel (ASTM C1617)	< DI water	< DI water	N/R ³	N/R ³	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	< 5 ppm Cl	Corrosion of Carbon Steel (ASTM C1617)
Density, lbs/ft3, (kg/m3)	15 max	15 (max)	11.9 – 18.7	11.9 – 18.7	5 – 11.2	10 – 15	10 – 15	10 – 15	7.5 – 11.2	Density, lbs/ft3, (kg/m3)
Linear Change at Max Temp (C356 / D2126), %	2% (C356)	2 – 8% max (C356)	2 – 10% max	2 – 10% max	<2%	< 2%	< 2%	< 2%	< 2%	Linear Change at Max Temp (C356 / D2126), %
Min. Flexural Strength (psi) Min. (C203)	50	45	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Min. Flexural Strength (psi) Min. (C203)
pH	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	pH
Behavior in a Vertical Tube Furnace (ASTM E136)	Pass	Pass	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed	0/0	0/5	0/10	0/10	25/50	5/10	5/10	25/50	5/10	Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed
Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	N/S	Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B
Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)	5.0	N/S ³	12	5.0	5.0	5.0	5.0	5.0	5.0	Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)
Water Absorption ⁽¹⁷⁾ ASTM C209, C272, C1763) %	N/S ³	50	N/S ³	N/S ³	8.0	8.0	8.0	8.0	8.0	Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %

Physical Properties ^{1, 4, 5, 6, 7}	Perpendicular Oriented Mineral Fiber	Spray Applied Cellular Polyurethane	Rigid Cellular Polyisocyanurate Faced Board	Glass Fiber Mechanically Bonded Felt	High Temperature Fiber Blanket	Layered Glass Fiber Felt Pipe	Layered Glass Fiber Felt Board			Physical Properties ^{1, 4, 5, 6, 7}
Type of Material	Fibrous	Cellular	Cellular	Fibrous	Fibrous	Fibrous	Fibrous			Type of Material
ASTM Standard Specification	C1393 Type I, II, IIIA, IIIB, IVA, IVB	C1029 Type I, II, III, IV	C1289 Type 1 and 2 Class 1,2,3,4/Grade 1, 2,3	C1086	C892 Type I-V	C1937 Type I Pipe	C1937 Type II Board			ASTM Standard Specification
Use Temp °F (°C) - Max.	450 (232) – 1000 (538)	225 (107)	200 (93)	1200 (649)	1350 (732) – 3000 (1649)	1400 (760)	1400 (760)			Use Temp °F (°C) - Max.
Use Temp °F (°C) - Min.	0 (-18)	-22 (-30)	-40 (-40)	75 (24)	75 (24)	75 (24)	75 (24)			Use Temp °F (°C) - Min.
Apparent Thermal Conductivity Test Method in the Stated Standard Specification	C177, C518, C1114	C177, C518, C1363	C177, C518, C1114, C1363	C335, C177, C518	C177, C201	C335	C177, C518			Apparent Thermal Conductivity Test Method in the Stated Standard Specification
⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:	⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:									⁶ Apparent Thermal Conductivity Max., Btu-in/h ft ² F (W/mK) at Mean Temperatures of:
-100°F (-73°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	N/A ³	See C892 for limits for each type	N/A ³	N/A ³			-100°F (-73°C)
0°F (-18°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	N/A ³	See C892 for limits for each type	N/A ³	N/A ³			0°F (-18°C)
75°F (24°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	0.29 (0.042)	See C892 for limits for each type	0.30 (0.043)	0.29 (0.043)			75°F (24°C)
200°F (93°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	0.34 (0.049)	See C892 for limits for each type	0.35 (0.050)	0.31 (0.045)			200°F (93°C)
400 °F (204°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	0.45 ((0.065)	See C892 for limits for each type	0.44 (0.063)	0.37 (0.054)			400 °F (204°C)
600°F (316°C)	See C1393 for limits	R-value of 6.2 at 1" and 75F mean temperature	See C1289 for R-value by Type and Class	0.58 (0.084)	See C892 for limits for each type	0.56 (0.081)	0.49 (0.071)			600°F (316°C)
Compressive Resistance, psi (kPa), (C165/C1621) – Min.	25 to 200 (1.2 to 9.6) 2 inch (50mm) at 10% deformation	See C1029 for compressive resistance by Type	See C1289 for performance by Type, Class and Grade	N/S ³	N/S ³	N/A ³	6.25 (43.1)			Compressive Resistance, psi (kPa), (C165/C1621) – Min.
Corrosion of Carbon Steel (ASTM C1617)	N/S ³	N/S ³	N/S ³	N/S ³	N/R ³	< 1 ppm Cl	< 1 ppm Cl			Corrosion of Carbon Steel (ASTM C1617)
Density, lbs/ft3, (kg/m3)	6 (96) or 8 (128)	N/S ³	N/S ³	N/S ³	3 (48)-12 (192)	14.5 (232)	13.5 (216)			Density, lbs/ft3, (kg/m3)
Linear Change at Max Temp (C356 / D2126), %	N/S ³	5,6,9 or 12 % as per Type	1.0% to 4.0% per C303	N/S ³	5.0%	2.0%	2.0%			Linear Change at Max Temp (C356 / D2126), %
Min. Flexural Strength (psi) Min. (C203)	N/S ³	N/S ³	40 (275) per C203	N/S ³	N/S ³	N/S ³	N/S ³			Min. Flexural Strength (psi) Min. (C203)
pH	N/S ³	N/S ³	N/S ³	N/S ³	N/S ³	9.1	9.2			pH
Behavior in a Vertical Tube Furnace (ASTM E136)	N/S ³	N/S ³	N/S ³	Pass	N/S ³	Pass	Pass			Behavior in a Vertical Tube Furnace (ASTM E136)
Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed	25/50	N/S ³	N/S ³	N/S ³	N/S ³	0/0	0/0			Surface Burning Characteristics Max (E84) ⁹ Flame Spread/Smoke Developed
Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B	N/S ³	3.0 (4.4 x 10 ⁻⁹)	0.3 - 8.0 (4.32x10 ⁻¹⁰ to 1.2x10 ⁻⁸)	N/S ³	N/S ³	N/S ³	N/S ³			Water Vapor Permeability ¹⁰ , Perm-in (g/Pa-s-m), Max (E96) Procedure A or B
Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)	5.0	N/S ³	N/S ³	N/S ³	N/S ³	2.0	2.0			Water vapor sorption (by weight) Maximum (%) (ASTM C1104/C1104M)
Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %	N/S ³	5.0	1.0 – 4.0 per Type and Class	N/S ³	N/S ³	N/S ³	N/S ³			Water Absorption ⁽¹⁷⁾ (ASTM C209, C272, C1763) %

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Notes:

1. All properties are for the generic material type and will vary by grade and by manufacturer. All properties should be verified with individual manufacturers. Properties that are not stated may or may not be an indication that a material is not appropriate for applications depending on that property. This should be verified with the specific manufacturer.
2. Surface burning characteristics may vary with thickness and/or formulation. See the manufacturer's data sheets.
3. The following are the definitions used in this chart for special situations:
N/A = Not applicable—The mean temperature for thermal conductivity is outside the scope of the ASTM standard for this material classification.
N/S = Not stated—The ASTM standard makes no mention of this property.
N/R = Not required—The ASTM Standard for this material classification does NOT have a required performance for this property but the ASTM standard does discuss this property or another material classification within the standard has a requirement for this property.
4. All properties listed above are for the core insulation material only and may not be indicative of the performance of an insulation system including vapor retarders, adhesives and sealants.
5. Many materials can be used for applications outside of the ranges listed above but additional precautions must be followed. The specific manufacturer should be consulted for detailed recommendations.
6. Some values such as specific thermal conductivities at various mean temperatures may be interpolated or extrapolated by a small amount.
7. This chart has been established for products with current ASTM standards.
8. Data found in this chart is generally derived from ASTM Standards. Some exceptions were made to provide more complete information on materials for better comparison purposes. In those cases, the information was derived by consensus of manufacturers and the NIA TIC Committee approval. This table does not contain all ASTM data points.
9. For guidance on Surface Burning Characteristics testing of products used in Canada, refer to the appropriate ASTM product specification for requirements or use CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
10. In ASTM E96, Procedure A is the dry cup method and Procedure B is the wet cup method.
11. These values are for design purposes only.
12. Mineral fibers are fibrous inorganic substances made primarily from rock, slag, or glass. These fibers are classified into two general groups: fiberglass (glass wool) and mineral wool (rock wool and slag wool). Note that many mechanical fiberglass products are typically lighter density with maximum use temperatures of up to 1000°F while mineral wool mechanical products are generally heavier density with a maximum use temperature of up to 1400°F. There are exceptions and manufacturers data must be consulted to ensure the maximum use temperature of the product is appropriate for its intended application.
13. Water absorption testing is not a required test parameter for mineral fiber insulation per C547, C553, C592 or C612. Data may not be provided by all suppliers of these materials.
14. Water absorption for Mineral Fiber Pipe (C547 Types II, III, IV, and V) is tested per BS EN 13472 – superseded by ISO 12623.
15. Water absorption for Mineral Fiber Blanket and Board (C553, C592, C612) is tested to BS EN 1609 – superseded by ISO 29767.
16. Consult manufacturer for specific recommendations and properties at temperatures less than -40°F (-40°C).
17. See individual product specifications for the applicable water absorption test procedure and limits.